Briefly, the following advantages are derived from the construction of the present invention.

(i) The distance traversed by the disk and the operation accompanying the movement are reduced, so that the disk access time is reduced to about two seconds, which means a reduction of one half as compared to that of the prior-art system.

(ii) The construction is simplified, production costs are lowered and the device is less susceptible to operational troubles or failures.

(iii) The disk storage space efficiency is improved and the overall device is reduced in size and weight.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view showing an automatic disk exchange device according to an embodiment of the present invention.

FIG. **2***a* is a plan view of a disk holder, shown partly in section.

FIG. **2***b* is a side view of the disk holder.

FIG. **3** is a perspective view showing a conventional automatic disk exchange device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An automatic disk exchange device according to a preferred embodiment of the present invention is shown in perspective in FIG. **1**, wherein the reference numeral **1** denotes a disk and the reference numerals **10***a*, **10***b* denote disk shelves. The reference numerals **11**, **12**, **13**, **14**, **15**, **16**, **17**, **18** and **19** denote a disk exchange window, a recording/reproducing device, a disk inlet/outlet port, a disk transport device, a disk holder, a drive unit, a transmission belt, a controller and a CPU, respectively.

As shown in the figure, the automatic disk exchange device according to the present invention is comprised of the disk shelves **10***a*, **10***b* for horizontally accommodating the disks **1** each in a cartridge, i.e., a square sheet-like container or cassette, the recording/reproducing device **12** for recording the information on the disk **1** and reproducing the recorded information from the disk, and the disk transport device **14** for taking one of the preselected disks out of the shelf **10***a* or **10***b* and attaching it to the recording/reproducing device **12**, or taking one of the preselected disks out of the recording-/reproducing device **12** and re-housing it into the shelf **10***a* or **10***b*. The disks **1** are held in the horizontal position while they are stored, subjected to a recording or reproducing operation, or are in transit.

The present automatic disk exchange device is 300 mm in width, 700 mm in height and 700 mm in depth and houses 60 sheets of direct read postscript type optical disks each 13.34 cm (5.25 inch) in diameter, the drive unit and the recording/reproducing device.

The disk transport device **14** includes a disk holder **15**, a support member **22**, a drive unit **16** and a drive belt **17** and is movable vertically by the drive unit **16** while being adapted for transporting the disks in the transverse direction for transporting the disks into and out of the shelves **10***a*, **10***b*. The disk holder **15** is structured so as to be rotatable for presenting the observe and reverse of the disk **1** as desired.

The controller **18** is formed by a 8-bit microprocessor.

FIGS. **2***a* and **2***b* show the disk gripper of the disk transport **14** in a plan view and a side elevational view, respectively. The disk gripper **15** is provided on its both ends with a rotational drum **20** that is supported by rotational guide rollers **21**, and is driven into rotation by an electric motor **23** and a rotational drive unit **24**. For transferring the disk **1** between the shelves **10***a*, **10***b* and the disk holder **15**, gripper rollers **31***a*, **31***b*, **32***a*, **32***b*, **33***a*, **33***b*, **34***a* and **34***b*, provided on the disk holder **15**, are employed. That is, a motor **35** drives cams **38** and **40** through a gear **36** and belts **37** and **39**, but those cams **38** and **40** have phases shifted by 180 degrees from each other, thereby to prescribe positions of the gripper rollers **31***a*, **31***b* and **33***a*, **33***b* by the rotational angle thereof. Besides, the rollers **31***a*, **31***b* and **33***a*, **33***b* are driven into rotation by a motor **25** through a gear **26** and belts **27** and **29**. The rollers **32***a*, **32***b* and **34***a*, **34***b* are driven into rotation in a similar manner by a mechanism not shown.

As illustrated in FIG. **2***a*, the disk exchange device comprises a main rocker arm **27**, **29** on one side of the disk transport device and an extension arm **28**, **30** connected with each of said main rocker arms and a pair of rollers **31***a*, **31***b*, **33***a*, **33***b*, mounted on each of said extension arms. Rollers **31***a*, **31***b*, **33***a* and **33***b* are driven by belts **27**, **29**. A pair of cams **38**, **40**, are simultaneously rotated 180 degrees out of phase with one another by belt **37** to selectively press the rollers **31***a*, **31***b*, **33***a*, **33***b* on the extension arms and idler rollers **32***a*, **32***b*, **34***a*, **34***b*, into contact with a selected disk cartridge thereby transferring the disk cartridge into or out of the disk transport device.

As described above, two sets of driving side gripper rollers **31***a*, **31***b* and **33***a*, **33***b* including as one set two gangs, the positions of which are prescribed by the cams **38** and **40** and two sets of follower side rollers **32***a*, **32***b* and **34***a*, **34***b* including as one set two gangs driven by means of cams in a similar manner through a link mechanism (not shown) and opposing **31***a*, **31***b* and **33***a*, **33***b* perform gripping operation of the disk **1** by one pair left and right, viz., **31***a*, **31***b* and **32***a*, **32***b* on the left side and **33***a*, **33***b* and **34***a*, **34***b* on the right side, and said gripping operation has the following three patterns.

i) The right hand side rolls are gripping the disk while the left hand side rolls are open, for transferring the disk into or out of the transport device at the right hand side;

ii) the left hand side rolls are gripping the disk while the right hand side rolls are open, for transferring the disk into or out of the transport device at the left hand side; and

iii) both the left and right hand side rolls are open, the disk being thus held or not held in the transport device.

One of these positions can be selected by a sensor and a flag, not shown, provided with three slits.

Referring to FIG. **1**, a CPU **19** is provided on top of the present exchange device and adapted to command the controller **18** and the automatic disk exchange device to perform a variety of mechanical operation such as loading, unloading or exchange of the disks **1**, as well as to perform recording and reproduction of the information on and from the disks **1**. The controller **18** is adapted to communicate with the CPU **19** to cause the mechanical system to perform predetermined mechanical operations.

In operation, when the disk **1** housed within the shelf **10***a* **10***b* is selected the drive unit **16** is driven into operation and the transmission belt **17** is thereby driven into operation to raise or lower the disk holder **15** to a selected shelf position. The gripper rollers **31***a*, **31***b*; **32***a*, **32***b* of the disk holder **15** are then actuated to grip the disk **1** within the shelf **10***a*. The disk **1** thus gripped is